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EXAMINER

GRAYBILL, DAVID E

ART UNIT PAPER NUMBER

2827

DATE MAILED: 03/07/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/874,666

Applicant(s)

RAMALINGAM ET AL.

Examiner

David E Graybill

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

At page 8, lines 19-21 and 23-25, applicant teaches, "the first underfill material 24 may be an epoxy produced by Shin-Itsu [sic] of Japan under the product designation Semicoat 5230-JP," and, "the second underfill material 26 may be an anhydride epoxy produced by Shin-Itsu [sic] under the product designation Semicoat 122X." However, applicant does not further describe these particular materials, and, a relevant search failed to find reference to the terms, "Shin-Itsu," "Semicoat 5230-JP," and, "Semicoat 122X." Therefore, it appears that applicant has misidentified the materials. Notwithstanding, "Shin-Itsu" appears to be a misspelling of the company name Shin-Etsu whose product catalogue discloses, "SEMICOAT Series," epoxy, underfill materials. Although applicant does not explicitly teach that the particular materials, "Semicoat 5230-JP," and, "Semicoat 122X" are prior art materials, in view of applicant's apparent misidentification of the materials, and the Shin-Etsu prior art catalogue, it appears that the materials, "Semicoat 5230-JP," and, "Semicoat 122X" are prior art.

Applicant and the assignee of this application are required under 37 CFR 1.105 to provide the following information that the examiner has determined is reasonably necessary to the examination of this application. Applicant is required to clarify the identity of the terms, "Shin-Itsu," "Semicoat 5230-

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JP," and, "Semicoat 122X" and confirm if the materials are prior art materials.

This Office action has an attached requirement for information under 37 CFR 1.105. A complete reply to this Office action must include a complete reply to the attached requirement for information. The time period for reply to the attached requirement coincides with the time period for reply to this Office action.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 7-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 7-23 and 25, it is unclear how the term "underfill" modifies the scope of the term "material." For example, it is unclear if the term "underfill" structurally limits the scope of the claim to a material that is underfilled, or merely limits the scope of the claim to a material that is capable of being underfilled.

In claims 12, 18 and 22, the scope of the term, "partial gel" is unclear because the term, "partial" is a vague relative

term of degree for which the disclosure provides no clear standard for measuring the degree, or it is not apparent if the degree is limited by the disclosure, and one of ordinary skill in the art in view of the prior art and the status of the art would not otherwise be reasonably apprised of the scope of the term.

In claims 13, 19, 20 and 21, the scope of the term, "partially gel" is unclear because the term, "partially" is a vague relative term of degree for which the disclosure provides no clear standard for measuring the degree, or it is not apparent if the degree is limited by the disclosure, and one of ordinary skill in the art in view of the prior art and the status of the art would not otherwise be reasonably apprised of the scope of the term.

In the rejections infra, reference labels are generally recited only for the first recitation of identical claim language.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 7, 8, 10-12 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Ameen (0340492).

At column, 8, line 6 to column 16, line 33, Ameen teaches the following:

7. A process for underfilling an integrated circuit that is mounted to a substrate, comprising:
dispensing a first underfill material 41 which becomes attached to the integrated circuit 4 and the substrate 12; and,
dispensing a second underfill material 44 which become attached to the integrated circuit and the substrate.
8. The process as in 11, wherein the first underfill material flows between the integrated circuit and the substrate.
10. The process as in 11, wherein the second underfill material is dispensed in a pattern which surrounds the first underfill material.

11. A process for underfilling an integrated circuit that is mounted to a substrate comprising:
heating the substrate before a first underfill material is dispensed; dispensing the first underfill material which becomes attached to the integrated circuit and the substrate; and, dispensing a second underfill material which become attached to the integrated circuit and the substrate.
12. The process as in 11, further comprising heating the first underfill material to a partial gel state.
14. The process as in 11, further comprising mounting the integrated circuit to the substrate with a solder bump 28 before the first underfill material is dispensed.

To further clarify the teaching of heating the first underfill material to a partial gel state, this process is inherent in the process of curing the underfill material because the underfill material reaches a partial gel state before it is reaches a cured state.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the

art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ameen as applied to claims 7, 8, 10-12 and 14, and further in combination with Banks (6015722).

Ameen does not appear to explicitly teach the following:

13. The process as recited in 12, wherein the substrate is heated to a temperature that is greater than a temperature for heating said first underfill material to said partially gel state.

Nevertheless, at column 41, line 63 to column 43, line 41, Banks teaches wherein a substrate is heated ["Prebake"] to a

temperature that is greater than a temperature for heating a first underfill material to a partially gel state. In addition, the prebake temperature of 165°C is greater than the temperature of 150° C for heating a first underfill material of Ameen to a cure state. Therefore, because it is inherent that the first underfill material reaches a partially gel state before it reaches a cure state, the prebake temperature is greater than the temperature for heating the underfill material to a partially gel state. Furthermore, it would have been obvious to combine the invention of Banks with the invention of Ameen because it would reduce undesirable moisture.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ameen (0340492).

Ameen does not appear to explicitly teach the following:
21. The process as in 13, wherein said temperature for heating said first underfill material to said partially gel state is greater than a temperature at which said second underfill material is dispensed.

Notwithstanding, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose the particular claimed temperature limitations because applicant has not disclosed that the limitations are for a

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particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using other temperatures. Indeed, it has been held that optimization of range limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See MPEP 2144.05(II):

"Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. '[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.'" In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). See also In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969), Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989), and In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990). As set forth in MPEP 2144.05(III), "Applicant can rebut a prima facie case of obviousness based on overlapping ranges by showing the criticality of the claimed range. 'The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other

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variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.' In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP § 716.02 - § 716.02(g) for a discussion of criticality and unexpected results."

Claims 9, 15-20 and 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ameen as applied to claims 7, 8, 10-12 and 14, and further in combination with Bouras (5906682).

Ameen teaches the following:

15. A process for mounting and underfilling an integrated circuit to a substrate, comprising: baking the substrate; mounting an integrated circuit to the substrate; dispensing a first underfill material onto the substrate, the first underfill material flows between the integrated circuit and the substrate; and, dispensing a second underfill material around the first underfill material.

16. The process as in 15, further comprising mounting the integrated circuit to the substrate with a solder bump before the first underfill material is dispensed.

18. The process as in 15, wherein prior to dispensing the second underfill material, the method further comprises heating the first underfill material to a partial gel state.

22. A process for mounting and underfilling an integrated circuit to a substrate, comprising: heating the substrate to a first temperature; mounting an integrated circuit to the substrate; dispensing a first underfill material onto the substrate; and, dispensing a second underfill material around the first underfill material.

23. The process as in 22, further comprising mounting the integrated circuit to the substrate with a solder bump before the first underfill material is dispensed.

However, Ameen does not appear to explicitly teach heating the first underfill material to a second temperature in which the first underfill material is in a partial gel state and flows between the integrated circuit and the substrate while the substrate moves through an oven or the following:

9. The process as in 8, wherein the substrate moves within an oven while the first underfill material flows between the integrated circuit and the substrate.

Nonetheless, at column 2, lines 42-67; column 3, lines 61-65; column 4, lines 36-40 and 61-65; column 7, lines 3-32; and column 8, line 57 to column 9, line 11, Bouras teaches heating a

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first underfill material to a temperature in which the first underfill material is in a partial gel state and flows between the integrated circuit and the substrate while the substrate moves through an oven. Furthermore, it would have been obvious to combine the invention of Bouras with the invention of Ameen because it would enable curing in an oven.

Also, the combination of Ameen and Bouras does not appear to explicitly teach wherein the baking of the substrate occurs before the first underfill material is dispensed. Still, Ameen teaches "preheating" of the substrate occurs before the first underfill material is dispensed, and teaches baking the substrate. In addition, it would have been obvious to preheat the substrate by baking because it would preheat the substrate.

The combination of Ameen and Bouras also does not appear to explicitly teach the following:

19. The process as in 18, wherein the substrate is baked at a temperature that is greater than a temperature for heating said first underfill material to said partially gel state.

20. The process as in 19, wherein said temperature for heating said first underfill material to said partially gel state is greater than a temperature at which said second underfill material is dispensed.

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24. The process as in 22, wherein the first temperature is greater than the second temperature.

25. The process as in 24, wherein the second temperature is greater than a temperature at which the second underfill material is dispensed.

Nevertheless, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose the particular claimed temperature limitations because applicant has not disclosed that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using other temperatures.

The prior art made of record and not applied to the rejection is considered pertinent to applicant's disclosure. It is cited primarily to show inventions similar to the instant invention.

Any telephone inquiry of a general nature or relating to the status (MPEP 203.08) of this application or proceeding should be directed to the group receptionist whose telephone number is 703-308-1782.

Any telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (703) 308-2947. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.

The fax phone number for group 2800 is 703/305-3431.

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David E. Graybill
Primary Examiner
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D.G.
4-Mar-02